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son, April 29, 1891, by J. W. Blair, and sent to Professor Kelly for identification, who now has it in the State Normal museum. This is the first adult bird of the kind taken in the State. The measurements are: Length, 23.75; stretch of wings, 37.00; wing, 10.55; tail, 4.25; tarsus, 4.00; bill, 5.50; middle toe, 3.30.

The plumage of this beautiful wader is glossed with a metallic luster, which shines with different colors in the varying shades of light, but at a distance appears black, and is generally known as the "black curlew."

In flight, its legs and neck are stretched out to their full extent. Upon dissection, I found its food to consist principally of snails, with a few fish.

They are found in the western United States, from Texas to California, north to Oregon, accidental to Kansas, and south through tropical America to Chili.

The nest is composed of broken cane and rushes, placed upon the tops of the living ones as a foundation. They are generally located in marshes and lagoons, in company with the herons. Eggs, usually three, 1.95 x 1.35; color, deep greenish blue.

The second appearance of Clarke's nutcracker in this State was a flock of five, seen on the Neosho river, north of Emporia. Mr. R. Evans, a student of our school, shot an adult male from this flock October 9, 1891, which was placed in the museum at the Normal.

They are an accidental visitant in Kansas, the first one being taken August 13, 1888, by Mr. Chas. Netz, near the south line of Marshall county. They are found in the high, coniferous forests of western North America, south to Arizona, east to the edge of the plains, but are seldom found below an altitude of 4,000 feet. The general color is bluish ash, gradually fading to white on the head; wings, greenish black. This bird has the habits common to several other species.

Like the woodpecker, it clings to the side of the trees while it hunts for the various forms of life found within; and in flying its motions are similar. It is wild, restless, and noisy like the jay. When on the ground, it walks like a crow.

Clasping with its sharp claws the cones of pines, with its peculiarly shaped bill it gouges out the seeds, which are its principal food. It often hangs, while thus engaged, with head downward, swinging back and forth, reminding one of the titmouse in its movements.

The measurements of the one I procured are as follows: Length, 12.50; stretch of wings, 22.00; wing, 7.50; tail, 4.50; tarsus, 1.20; bill, 1.50. The nest is rather bulky, composed of sticks and twigs lined with small vegetable fibers; at first appearance reminding one of a squirrel's nest. Average size of eggs, 1.22 x .92. Their color is light grayish green, irregularly spotted with a deeper shade of gray, chiefly around the large end.

ALL ENERGY IS KINETIC.

BY E. B. KNERR, ATCHISON, KAS.

One of the most perplexing subjects to the minds of students in physics is the subject of so-called "potential energy"—perplexing because the student is dealing with a fallacy. The term in itself is a contradiction, meaning, as it is usually accepted, "possible energy." Now, the nature of energy is such that it either is or it is not; there can be no such a condition, in strict science, as a "possibility" for it. In short, there is but one energy, and that is all "kinetic," always.

The mathematical formula for energy stands $E = \frac{1}{2} M V^2$, which means that the energy of any body of matter is equal to one-half the product of its mass units into

the square of its velocity units. Now clearly, unless a body have motion, it can have no velocity, and if it have no velocity it certainly can have no energy; for if we substitute zero for V in the above formula it works out that $E=0$; that is, when the body is at rest it possesses no true energy. But it may be objected that the formula is for "kinetic" energy, and hence will not apply to "potential" energy. Will some one, then, kindly supply us with a mathematical formula applicable to this very peculiar form of "capacity for work" (the usual definition for energy). The formula so given must be reducible to the general formula for energy ($E=\frac{1}{2} M V^2$) else evidently it can represent nothing in common with true energy whatever. But, whoever makes this formula, let him remember that, as soon as V becomes zero, E also becomes zero. Clearly, then, the only energy is energy of motion—kinetic energy.

How then explain those illustrations of "potential" energy so common to modern text-books on physics, such as placing a weight on a shelf, throwing a stone upward till it comes to rest, or the "storage of solar energy" in coal, or the winding of a spring, or any of the many other illustrations that might be cited?

We will take the case of the throwing of a stone upward into space, as it is the one most usually presented. As commonly given, it is about as follows:

If a boy cast a stone upward, the moment it leaves his hand it is possessed of a certain amount of kinetic energy imparted by the boy's strength exerted in the act of throwing. But the stone loses motion gradually, and after a few seconds comes to rest; then instantly begins to return to earth, and finally strikes with the energy it had on starting. The kinetic energy the stone had on leaving the hand is gradually converted to "potential" energy, until, when it reaches the maximum height, it will have no kinetic energy, for it is at rest; but will have an equivalent "potential" energy. It will have a certain "advantage of position," for if it is allowed to fall to earth it will be capable of performing as much work as was done upon it in placing it in that position. Thus the books explain it.

Now let me ask how much "potential" energy that same stone would have when it comes to rest, had it been thrown horizontally over the smooth ice of a frozen lake. Unquestionably it will have no energy, for the energy of motion imparted to the stone as it was cast over the ice is gradually converted to heat energy, as it meets atmospheric resistance and impinges against the ice.

So exactly in the case of throwing the stone upward. It starts with considerable energy of motion, a part of which, owing to atmospheric resistance is turned to heat; but the greater remainder is gradually overcome by the continually-acting counter force of gravity; so that, when the stone has reached the maximum height, the total reaction has just equalled the total action. There has been no storage of energy whatever in the stone. Where, then, is the energy the stone had when it began its ascent? The law of conservation of energy demands that it must exist somewhere. We noticed that it was gradually leaving the moving body, for the velocity was uniformly diminished. Whither did it go? It is not in the stone in any of the forms familiar to us as heat, light, electric or life energy; nor is it there as energy of motion, for the stone is now at rest. Where, then, can it be? *It exists as energy of gravitational force*, not in the stone, but in that rarest of mediums, the "fourth state of matter," the luminiferous ether, whose vibrations constitute the *force of gravity*.

To say that the stone was possessed of a certain amount of "potential" energy *before* it was started upward, by virtue of which it would be possible for it to rise, overcoming atmospheric resistance and gravity, would be no more absurd than to declare it possessed of "potential" energy when once it had reached the highest position in its path, by virtue of which it could fall to earth and do exactly the equiva-

lent of work performed upon it to raise it to that position. The only difference in the two cases is, that the boy cast the stone upward, while gravity hurled it back. We might, with equal propriety, affirm that, after the stone cast over the ice had come to rest, it had acquired "energy of position," as to say a like thing of this stone as it turns to descend from mid-air. Should the boy run over the ice after the stone and push it back with his foot, starting slowly, but gradually increasing his speed until he reached his first position, we all would consider this a new problem, having no connection whatever with the throwing of the stone; for the boy might have returned with another stone equal in weight, and the result would have been the same, so far as the necessary energy was concerned. Likewise must we consider the return of the stone to earth a fact separate and distinct from the rising of the stone.

As the stone falls, we observe it acquiring increased energy, for its velocity is increasing. This is only a further illustration of the transformation of energy of gravity force to the energy of a moving mass. It is but another evidence that gravity is a correlated force.

"Potential" energy is sometimes defined as "energy of position," and in a popular text-book on physics we find the question: "What has become of the energy expended in the building of the Egyptian pyramids?" The author does not give the answer, but from the text it is evident that he would say that it is "stored" in the stones as "potential" energy, or "energy of position." Now, how can position have energy? or, how can matter have energy by virtue of "advantage of position?" Nothing but matter can have energy, and then only by virtue of its motion. The energy exerted in raising the stones to their present position is not in the stones, but as they were lifted against the force of gravity that energy was transformed to gravity energy.

Sometimes "potential" energy is regarded as a form of suspended or arrested energy. This conception is directly antagonistic to the law of conservation of energy, which teaches that the sum total of energy is a constant, never increased or diminished. Now, if energy be arrested or suspended for a moment, is it not for that length of time practically destroyed—gone out of existence—diminishing the sum total to that extent? And if it may be arrested for one moment, why not for a longer time—an hour? And if for an hour, why not for a day, a year? Why not for eternity? Why may it not be annihilated? Clearly true energy cannot be suspended for the smallest fraction of time. When motion of a mass is transformed to heat of a mass by friction, for instance, there is absolutely no interval of time required for the transformation of any particular portion of the energy. It is now motion, and now instantly it is heat.

If this be truth, it may be asked whence the heat energy of burning coal? The books say it is the solar heat and sunshine of ages ago "stored" in the coal as "potential" energy. It is surprising that such a blunder should be so long-lived; for consider now what takes place when a piece of coal burns. The coal of itself cannot burn; it requires oxygen with which it may unite, and the process of combination is called burning. Then why not affirm that the heat is derived from the potential energy stored in the oxygen? That certainly would be as reasonable as to declare that the energy was started in the coal. Why not give the oxygen at least half the credit of carrying all this power these ages? In the growth of the plants which were afterwards transformed into coal, the sun's rays of heat and light played an important part indeed in enabling the plant chlorophyll to separate the carbon from the oxygen of the carbon dioxide, derived, for the most part, from the surrounding air; but by no means could the energy of that heat and light be "shelved," as it

were, in the carbon and oxygen thus separated. Rather this energy was transformed to chemism, an active kinetic energy, a vibration of oxygen atoms in the oxygen molecule, and a vibration of carbon atoms in the carbon molecule, or, more correctly, a vibration of the atoms of the complex molecules forming the vegetable structure. The sum of the amount of vibration in the oxygen molecules, as such, and the amount of vibration in the vegetable molecules, is more than was the amount of atomic vibration in the carbon dioxide before it was separated, by just that degree of energy represented by the solar heat and light employed in the separation. But, to induce this higher rate of vibration necessary to the existence of the new molecules of oxygen and carbon, is not storing energy in those molecules any more than it is "storing energy" to convert the energy of motion of a revolving armature to electricity. In short, the energy of the sun's heat and light is converted to chemism, a form of kinetic energy. When now, ages after those plants have grown and fallen to earth and become coal, the conditions being made favorable for the carbon to unite with oxygen, they combine; chemism is again transformed to heat and light.

Would it not be well for authors of text-books on physics to drop this very meaningless and annoying expression of "potential" energy? Let the student be taught that all energy is kinetic. Let him know that if energy disappears in one form of motion it surely appears in some other form of motion, and that to speak of a body at rest as having any kind of energy whatever is an absurdity.

SOME STATISTICS RELATING TO THE HEALTH OF COLLEGE WOMEN.

BY GERTRUDE CROTTY, LAWRENCE.

"Paris," writes Colonel Higginson, "smiled for an hour or two, in the year 1801, when, amidst Napoleon's mighty projects for remodeling the religion and government of his empire, the ironical satirist, Sylvian Marechal, thrust in his 'Plan for Prohibiting the Alphabet to Women.'" I hope you, in the year 1891, will find occasion to smile at the thought that woman should not attend college, because, as is claimed, of her mental inferiority to men, or her physical inability to endure college training. If her mind is weak, then it ought by all means to be strengthened, provided always that it is not done at the expense of her physical welfare. But it is not my purpose to consider woman's mental strength, as compared with that of man, or to treat of her mind in any respect, except in so far as study affects her mind, and her mental condition affects her health.

Doctor Beard, an eminent physician and psychologist of New York, in investigating the effect of scholarly employment upon the length of men's lives, computed the lives of 500 men of mental attainments—poets, philosophers, scientists, educators, lawyers, physicians, etc.—and found the average age to be 64 years; while the average life of the masses was but 50 years, and even then only those who lived to be 20 years of age or over were included in his calculation. The average age of 100 brain workers of our own time he found to be 70 years. If mental occupation is instrumental in lengthening men's lives, why may not women likewise profit by it?

We hear a great deal of complaint to the effect that the American woman is physically inferior to the women of Europe—of Germany. And only too often are we told that this physical weakness is the result of confinement in schoolrooms, and of